APPENDIX F

AIR QUALITY CONSTRUCTION EMISSIONS CALCULATIONS

This appendix includes copies of the calculations backup by year. A quantitative construction-related impact evaluation for the proposed Gary/Chicago International Airport construction activities was conducted for all construction modules during scheduled construction years 2005, 2006, and 2007, respectively, to evaluate pollutant emissions and air quality conformity.

				ø	SIC Average	Indiana	a State Em.	ssion (tan.	s/year) Pe.	SIC		Calculate	d Unit Emi	ssion Facto	ou-du/b) suc			1		Construction Equipment Hourly Emission Factors (gindur operated)	QUIDMENT H	outly Emissic	n Factors (ado inpurt	ared)	
	FPA	indiana State b	indiana State Equipment inventory		Activity/Equip	SQ.	OC NOX CO	CO P	PM10 PM2.5		> Sox	VOC N	ن ۆ	O PMS	OC NOX CO PM10 PM2.5	SOx SOx			On-Site Canst.	VOC	Š	8	PM10	PM2.5	SOX	
Equipment Type	SIC Code	НР Каляе	HP Range Population Avg. HP	1	(hour/year)												Equipm	Equipment Type Er	Engine HP							
Month again a second	2270003054	300 - 800	134	450	1841	12.95	296.57				69.69			0 261),14 D.	13 D	.43 tri-axle dump truck	truck	460	54.73	1,253.33		65.17	61.28	197.32	
hodening average	7270007038	175 300	544	238	1092	54 14					5.12			0 521	3,19 0.	17 0		avator	315	85.05	890.57		58.48	54.38	139.53	
dozer	2276002069	300 - 600	46.	450	936	39.15	852.79 2	284.43	40.94	37.66 9	91.13	0.18	3.20	1,33 0			0.43 dozer		305	55.90	975.00	406.1E	5B.46	53.78	130.13	
track loader	2270002066	100 - 175	2772	138	1135	124.09					9.79						.17 track loader		305	79.25	455.54		51.34	47.24	50.96	
motor oraderficación	227000304B	175 - 300	575	238	282	30.48	418.73				4.07								200	42.10	578.30		38.34	35.27	68.49	
off-road water waddn	2270002051	175 ~ 300	47	238	1641	4.38			3.57		9.53						·	ar wagon	175	37.96	491.84		30.94	28.77	B3.4B	
627 scraper	2270002018	175 ~ 300	167	238	914	€0.6	124.50				5.92								225	51.07	701.00		45.45	42.79	106.53	
521 scraner	2270002018	300 - 600	278	450	914	22.13					1.43								330	58.06	1,015.51		62.81	57.77	134.94	
815 competer	2270002009	16 - 25	10	2	484	0.05					0.03							tor	220	98.39	511.61		59.03	59.03	59,03	
vin Boller	2270002015		131	238	780	5.05					0.04								250	48.44	659.03		44.70	41.15	96.30	
rea chioner	2270002030		525	138	593	2.21					3.2B								120	35.93	42073		32.65	30.08	53.32	
hydro sae der	2270002024	300 - 600	N	450	261	0.24					0.33							_	400	372.85	2,182.25	-	180.05	165,65	237.67	
off-mad dumn truck	2270002061	360 ~ 600	15	450	1491	12.95	296.57				8.69						•	truck	360	42.83	980.87		51.00	47.98	154.42	
occupator transco	2270002038	175 - 300	917	238	1092						8.12						•	pac	240	48.56	675,53		44.55	41.43	106.31	
work train (rail work)	22700020R5	300 - ROD	158	450	606						1.22						-	ail work)	250	75.43	595.93		77.75	71.53	111.93	
mobile crane	2270002045	300 ~ BUD	106	450	085						4.23						-		400	60.37	967.63		52.05	47.90	109.58	
national parts plant	2270002042	100 ~ 175	9	138	275		1.4.				6.12						.29 concrete batch plant	ch plant	275	85.64	928.85		79.05	72.46	79.05	
concrete haul truck	2270502051	300 - 600	134	450	1641						69.9							al truck	460	54.73	1,253.33		65.17	61.28	197.32	
concrete mix truck	2270002051	300 ~ 60D	134	450	1641	12.85	236.57				69.69				0.14 0.	0.13 0		truck	460	54.73	1,253.33		65.17	61.28	197.32	
concrete cumo fruck	2270002051	175 - 600	181	34.4	1961	17.33	353.32 1				6.32						U	np truck	360	55.51	1,131,70		60.83	57.08	180.40	
line truck (class I)	2270002051	300 ~ 600	134	450	1641	12.95		105,11			69.9	0.12					_	() \$58	320	38.07	871.88		45.33	42.83	137.25	
auger fruck (class I)	2270002051	300 ~ 600	134	450	1641	12.95		105,11			6.69	G.12	2.72				(43 auger truck (class ?)	class :)	460	54.73	1,253,33		65.17	61.28	197.32	
ine truck (class II)	2270002051	300 ~ 800	134	450	1641	12.95		105.11			6.69	0.12					_	ass II)	460	54.73	1,253.33		85.17	61.28	197.32	
concrete slip form paver		175 ~ 300	95	238	523	3,56		13,72	3.27	3,01	7.27	0.17					.35 concrete slip form paver	тогт рамег	335	57.80	792.93		53.09	48.87	\$18,G3	
concrete finisher		100 ~ 175	56	138	522	1.55		7.70			2.46	0.30	3.60				.47 concrete finisher	sher	175	52.62	630.17		46.32	44.35	81.42	

_					or This Modu		% Work
<u>Module</u>	voc	NOx	СО	PM10	PM2.5	SOx	Scheduled in 2005
1	1.042	5.946	2.046	0.347	0.326	0.913	100%
2	0.339	1.761	0.606	0.103	0.097	0.270	100%
3	0.104	0.835	0.288	0.049	0.046	0.128	100%
4	0.062	0.860	0.324	0.057	0.053	0.121	20%
5	0.000	0.000	0.000	0.000	0.000	0.000	0%
5A	0.000	0.000	0.000	0.000	0.000	0.000	0%
6	0.000	0.000	0.000	0.000	0.000	0.000	0%
7 A	0.000	0.000	0.000	0.000	0.000	0.000	0%
7B	0.000	0.000	0.000	0.000	0.000	0.000	0%
8	0.000	0.000	0.000	0.000	0.000	0.000	0%
9	0.000	0.000	0.000	0.000	0.000	0.000	0%
10	0.000	0.000	0.000	0.000	0.000	0.000	0%
11	0.161	2.225	0.971	0.158	0.146	0.295	60%
mmary (tons)	1.707	11.627	4.235	0.714	0.668	1.727	
5	0.000	0.000	0.000	0.000	0.000	0.000	0%

1		8	5	20	37	123	76	88	監	8	op op	9	37	57	53	g	56	8	36	38	33	e	æ	38	 	4
erated) SOx		196			50.97																					1.0
(ghour op PM2.5		60.20	52.33	50.13	45.22	34.38	27.07	41.68	54.36	59.03	40.04	28.72	156.45	47.11	39.86	56.42	45.38	72 46	50.20	60.20	56.82	41.88	60.20	60.20	47.71	42.27
n Factors PM10		64.02	58,25	54.49	48.62	36.97	29.45	44.82	58.45	59.03	43.04	30.95	172.85	SC. 10	42.86	71.43	48.82	79.05	64.02	54.02	61.08	44.53	64.02	64.02	51.21	45.85
nty Emissio CO		415.49	229.77	370,55	293.B4	151.15	133.66	184.60	393.64	295.16	181,91	160.45	1,130.74	325,17	175.06	479.32	250.49	362.32	415.49	415.49	374.75	289.04	415.49	415.49	213,43	231,19
pment Hou NOx		139.90	818.76	909.25	438.09	536.71	434.33	652.71	948.83	511.61	619.71	400.56	2,124.63	892.09	623.62	944.13	913.97	926.65	1.139.90	1,139.90	1,053.68	792.97	1,139,90	1,139.90	744.62	601.88
Construction Equipment Hourly Emission Factors (phour operated) VDC NOx CO PM10 PM2.5 S		52.03	19.09	49.47	75,33	38.41		47.89				33.96				69.45			52.03	52.03	53.65	36.20	52.03	52.D3	54.55	50.08
Estimated On-Site Const. Engine HP		460	315	305	305	200	175	225	330	220	250	120	400	360	240	250	400	275	480	460	360	320	460	460	335	175
On-Si-																									1	
Foulthment Type		tri-axle dump truck	hydraulic excavator	gozer	track loader	motor grader	off-road water wagon	627 scraper	621 scraper	815 compactor	vib. Roller	tree chipper	hydro seeder	off-road dump truck	excavetor trapac	work train (rail work)	mobile crane	concrete batch plant	concrete haul truck	concrete mix truck	concrete pump truck	line truck (class I)	auger truck (class i)	line truck (class II)	concrete slip form paver	concrete finisher
SOx		0.43	0.44	0.43	71.0	D.44	0.48	0.47	0.41	0.27	0.39	0.45	0.61	0.43	0.44	0.45	0.27	0,29	0.43	0.43	0.51	0.43	6.43	6.43	0.35	0.47
		0.13	0.17	0.15	0.15	0.17	0.15	0.19	0.16	0.27	0.16	0.24	0.40	0.13	0.17	5.27	0.11	0.26	0.13	0,13	0.16	0.13	0,13	0.13	0.14	0.24
Calculated Unit Emission Factors (g/hp-hour OC NOX CO PM16 PM2.5		0.14	0.18	0.18	0.16	0.18	0.17	0.20	0.18	0.27	0.17	0.26	0.43	0.14	0.18	0.29	0.12	0.29	0.14	0.14	0.17	0.14	0.14	0.14	5,15	0.26
CO PA		0.90	0.73	1.21	96.0	9,76	97.6	0.82	1.19	34	0.73	1.34	2.83	0.90	0.73	1.92	0.63	1,32	0.90	0.90	1.04	0.90	0.90	06.0	0.64	1.32
NOx (2.48	2.60	2.98	1.44	2.68	2.48	2.90	2.88	2.33	2.48	3.34	5.31	2.48	2.60	3.78	2.28	3.38	2.48	2.46	2.93	2.48	2.48	2.48	2.22	3.44
Calculate VOC N		0.11	0.19	0.16	0.25	0.20	0.20	0.21	0.16	0.36	0.18	0.28	0.41	0.11	0.19	0.28	0.14	0.31	0.51	0.11	0.15	0.11	0.11	0.11	0.15	0.29
SOx		17.85	119.02	93.42	81.80	65.65	9.87	19,40	52.72	0.03	10.29	3,37	0.34	47.85	19.02	21.75	14,59	0.12	47.85	47.85	57.72	47.85	47.85	47.85	7.45	2.52
		14.67	44.83	35.94		25.50	3.19			0.03		1.81	0.22	14.67	•				14.67	14.67	17.74	14.67	14.67	14.67	3.00	1.30
Indiana State Emission (tons/year) Per SiC OC NOx CO PM10 PM2.5		15.50	47.99	39.07	78.03	27.42	3.47	8.15	22.84	0.03	4.59	1.95	0.24	15.60	47.99	13.88	6.52	G. 12	15.60	15.60	19.07	15.60	15.60	15,60	3.22	1.41
CO F		01.25	95.02	69,69	471.57	12.31	15.75	33.57	53,81	0.15	19.40	10.11	1.57	01.25	96.02	93.17	33.45	0.55	01.25	11.25	17,00	101.25	101.25	01.25	13.42	7.11
State Em		277.78 1	698.50				51.18					25.24					122.05		277.78						46.82	
15		12.68	51.71	35.47	120.90		4.07	8.71			4.85	2.14	0.23	12.65	51.71		7.40		12.68	12.68	16,75		12.68	12.68	3.43	1.54
SiC Average Activity/Equip		1641	1092	936	1135	362	1641	814	874	484	760	593	561	1641	1092	605	990	275	1641	1641	1941	1641	1541	1641	521	622
Ì,		450	238	450	138	238	238	238	450	21	23B	138	450	450	23B	450	45D	138	450	450	344	450	450	450	238	138
Inciana State Equipment Inventory UP Personal Pe	N.C.	138	940	472	2841	585	48	171	285	10	134	25	2	138	940	152	109	10	138	138	181	138	138	136	855	55
Indiana State Equipment In	2	300 ~ 600	75 ~ 3DC	009 ~ 008	175	75 ~ 300	175 - 300	75 ~ 300	900 - 800	18 ~ 25	175 - 300	175	300 ~ 600	009 - 008	75 ~ 3dD	009-0	300 ~ 600	100 ~ 175	DOS ~ DOS	300 - 600	0.75 ~ 600	000 ~ 000	009 - 008	3DC ~ 60G	5 - 300	100 175
'		_		_			•				Ť	•									•		***	_		
EPA Code	9	227560265	2270002036	2270002065	2275002086	227D002048	2270002053	2270002018	2270002018	2270002009	2270002015	2270002030	227D0G2024	227006255	2270002536	2270002585	2270002045	2270002042	2270002051	2270002051	2270002051	2270002051	227000205	2270002051	2270002003	
Seculphone of Dans	adf mandaha	ts-axle dumn truck	hydraulic excavator	dozer	track loader	motor grader	off-road water wapon	327 scraper	621 scraper	815 compactor	vib. Roller	tree chipper	hydro seeder	off-road dump truck	excavator trapac	work train (rail work)	mobile crane	concrete basen plans	concrete haul truck	concrete mix truck	concrete numb truck	line truck (class I)	auger fruck iclass I)	line Muck (class II)	concrete slip form payer	concrete finisher

_				1 /	or This Modu		% Work
<u>Module</u>	VOC	NOx	со	PM10	PM2.5	SOx	Scheduled in 2006
1	0.000	0.000	0.000	0.000	0.000	0.000	0%
2	0.000	0.000	0.000	0.000	0.000	0.000	0%
3	0.000	0.000	0.000	0.000	0.000	0.000	0%
4	0.168	2.412	0.907	0.164	0.153	0.363	60%
5	0.000	0.000	0.000	0.000	0.000	0.000	0%
5A	0.590	9.033	3.239	0.578	0.539	1.334	65%
6	0.000	0.000	0.000	0.000	0.000	0.000	0%
7 A	0.219	3.887	1.389	0.239	0.223	0.629	40%
7B	0.032	0.545	0.197	0.034	0.032	0.087	20%
8	0.000	0.000	0.000	0.000	0.000	0.000	0%
9	0.000	0.000	0.000	0.000	0.000	0.000	0%
10	0.059	0.869	0.304	0.053	0.050	0.121	40%
11	0.101	1.398	0.609	0.101	0.094	0.198	40%
mmary (tons)	1.169	18.144	6.646	1.169	1.091	2.733	
5	0.381	5.992	2.102	0.374	0.349	0.880	60%

	l		*	•	נרי	an	0	es S	Er.	, -	е	~	en	~	ı,	6	G.	5	5	4	4	40	9	₩.	4	æ	so.
erated)	čs		196.84	139.5	130.18													108.95						196.8	196.8	119.0	82.4
g/hour op	PM2.5		60.24	49.87	46.91	43.38	32.88	27.29	39,87	50.08	59.03	38.63	27.44	151.25	47.15	38.00	62.00	42.20	72.46	60.24	60.24	55.70	41.9	60.24	60.24	45.67	40.90
n Factors	PM10		61.59	54.21	50.99	47.15	35.74	29.33	43.31	54.43	59,03	41.55	29,76	165.65	48.26	41.30	67.38	45.84	79.05	61.69	61.69	59.37	42.91	61.69	61.69	49.72	44.42
Construction Equipment Hourly Emission Factors (g/hour operated)	9		383.72	226.58	337.18	277.22	147,47	131.98	179.62	357,98	295.16	174.72	145.40	1.080.32	30B.13	172.63	450.60	233.50	362.32	393.72	393.72	346.73	273.89	383.72	393.72	207.29	209.31
propert Hou	ŏ		99.960	752.81	841.35	418.29	497.98	387.87	606.90	879.87	491.93	563.12	374.66	067.02	811.32	573.57	896.88	858.66	928.85	036.68	C36.68	928.00	721.17	636.68	.036.68	699.18	563.70
uction Equi	voc		50.24	56.67	_	71.13								158.45 2					85.64				34.95	50.24	50.24	51.59	46.02
Constr	>																										
Estimated	On-Site Const.	Engine HP	460	315	305	305	200	175	225	330	220	250	120	400	360	240	250	400	275	460	460	360	320	460	460	335	175
		//be	×	-0.				agon							¥		ork)		aut	ž	*	uck	_	<u>=</u>	_	n paver	
		Equipment Type	i-axle dump truck	ydraulic excavato	zer	rack loader	otor grader	iff-road water wagor	327 scraper	621 scraper	5 compactor	/ib. Roller	ree chipper	ydro seeder	M-road dump truck	excavator trapac	work train (rail work)	nobile crane	concrete batch plant	concrete haul truck	concrete mix truck	concrete pump truck	ne truck (class I)	auger truck (class)	ne truck (class II)	concrete slip form paver	concrete finisher
			ъ	Ž	Ð	tta	Ĕ	ŧ	62	62	83	4	tre	Ē	F ₀	ě	J.M.	Ĕ	8	8	8	0	₹	9	Ē	3	8
	ŏ		0.43	0.44	5,43	0.17	5.44	0.47	0.47	0.41	0.27	0.39	D.45	0.61	D.43	0.44	0.45	0.27	0.29	D.43	0.43	0.50	0.43	0.43	0.43	0.36	0.47
p-haur)	PM2.5		0.13	0.16	0.15	0.14	0.15	0.16	6.18	0.15	0.27	0.15	0.23	0.38	0.13	0.16	0.25	0.11	0.26	0.13	0.13	0.15	0.13	0.13	0.13	0.14	0.23
Calculated Unit Emission Factors (g/hp-hour)	PM10		0.13	0.17	0.17	0.15	0.18	0.17	0.39	0.16	0.27	0.17	0.25	0.41	0.13	0.17	0.27	0.11	0.29	0.13	0.13	0.15	0.13	0.13	0.13	0.15	0.25
Emissian F	8		0.86	0.72	1.1	0.91	0.74	0.75	08.6	1.08	1.34	0.70	1.21	2.70	0.86	0.72	1.80	0.58	1.32	0.86	0.86	96.0	0.86	98.0	0.86	0.62	1.20
ted Unit E	ě		2.25	2.38	2.76	1.37	2,49	2.25	2.70	2.67	2.24	2.33	3.12	5.17	2.25	2.39	3.59	2.15	3.38	2.25	2.25	2.58	2.22	2.25	2.25	5.09	3.22
Calcula	VOC.		0.11	0.18	0.14	0.23	0.18	0.18	0.20	0.14	0.36	0.17	0.28	0.40	0.11	0.18	0.26	0.13	0.31	0.11	0.11	0.14	0.11	0.11	0.11	0.15	0.26
	SOx		49.01	21.93	95.70	83.81	67.28	10.11	19.87	54.01	0.03	10.54	3.45	0.34	49.01	21.93	22.28	14.95	0.12	49.01	49.01	59.12	49.01	49.01	49.01	7,64	2.58
er SIC			15.00	43.59	34.49		24.97									43.59			0.1	15.00	15.00	18.35	15.00	15.00	15.00	2.83	1.28
idn (tons/year) Per SIC	PM10 F		15.36	47.38	37.49	77.51	27.54	3.60	90.8	2: 79	0.03	4.53	1.92	0.23	15.36	47.38	13.42	6.29	0.12	15.38	15.36	19.56	15.35	15.36	15.36	3.19	1.39
t) ussian (to	8		98.03	158.03	247.91	455.70	111.98	16.20	33.43	143.31	0.15	19.05	9.38	1.50	58.03	198,03	39.75	32.04	0.55	58.03	98.03	:14.23	98.03	98.03	98.03	13.30	6.55
Indiana State Emiss	×0K		258.12	657.95	618.60	687.60	378.13	47.61	112.95	352.24	0.25	63.58	24.17	2.87	258.12	557.95	178.64	117.82	1.41	258.12	258.12	305.73	258.12	258.12	258.12	44.85	17.64
Indian	VOC		12.51	49.53	32.20	116.93	28.07	3.78	8.37	18.45	0.04	4.68	2.01		12.51		12.86	96.9	0.13	12.51	12.51	16.29	12.51	12.51	12.51	ě	1 44
SIC Average	Activity/Equip	(hour/year)	1641	1092	939	1135	295	1641	934	9:4	484	760	593	561	1641	1092	909	066	275	1641	1641	1641	1641	1641	1641	821	622
		4a. HP	450	238	450	138	238	238	238	450	7	238	138	450	450	238	450	450	138	450	450	344	450	450	450	238	138
	quipment Inve	opulation A	141	963	\$ 84	2910	603	8	175	292	0	137	98	2	141	963	186	152	ç	141	141	191	141	141	141	100	56
	Indiana State Equipment Inventory	HP Range Populaton Avg. HP	300 ~ 600	175 - 300	3CO ~ BO3	100 ~ 175	175 ~ 300	175 - 300	175 ~ 30D	300 - 600	16 ~ 25	175 - 300	100 ~ 175	300~600	300 ~ 600	175 ~ 300	300 600	300 - 600	100 ~ 175	300 ~ edD	300 ~ 600	175 - 600	300 ~ 600	300 - 900	300~000	175 ~ 300	100 ~ 175
	EPA Ir	SIC Code	2270002051	2270002036	2270002069	. 990ZDCQ4ZZ		2270002051		2270002018			. 0502000422	_	2270002051		2270002081			_	2270002051	2270002051	2270002051	2270002051	2270002051	2270D02D03	2270002021
		Equipment Type	tri-axle dump truck	hydraulic excavator	dozer	track loader	motor grader	г мадоп	527 scraper	621 scraper	actor	vib. Roller	tree chipper	hydro seeder	off-read dump truck		work train (rail work)	mobile crane	concrete batch plant	constrete haul truck	concrete mix truck	concrete pump truck	line truck (class I)	auger truck (class I)	line truck (class II)	concrete slip form paver	concrete finisher

_					or This Mode	ıle	% Work
Module	VOC	NOx	CO	PM10	PM2.5	SOx	Scheduled in 2007
1	0.000	0.000	0.000	0.000	0.000	0.000	0%
2	0.000	0.000	0.000	0.000	0.000	0.000	0%
3	0.000	0.000	0.000	0.000	0.000	0.000	0%
4	0.052	0.747	0.285	0.052	0.049	0.121	20%
5	0.000	0.000	0.000	0.000	0.000	0.000	0%
5A	0.295	4.512	1.639	0.297	0.277	0.718	35%
6	0.132	2.258	0.812	0.144	0.137	0.409	100%
7A	0.310	5.363	1.971	0.344	0.326	0.945	60%
7B	0.120	2.012	0.750	0.132	0.125	0.349	80%
8	0.046	0.816	0.315	0.052	0.049	0.143	100%
9	0.178	3.047	1,123	0.197	0.188	0.545	100%
10	0.083	1.213	0.430	0.076	0.072	0.182	60%
11	0.000	0.000	0.000	0.000	0.000	0.000	0%
nmary (tons)	1.216	19.967	7,323	1.294	1.223	3.412	
5	0.236	3.702	1.316	0.238	0,222	0.586	40%